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ROYAL BOTANIC GARDENS, KEW

XXX.—AFRICAN LEATHER DYES. J. M. Dalziel.

The original "morocco" of the Moors in Spain and North Africa was a sumach-tanned goat-leather, which was dyed red—before the tanning—with kermes, using alum as a mordant. Hausa or Kano leather tanned with "sant" pods (*Acacia arabica* Willd.), is very similar to genuine "morocco," which is now closely imitated in calf and sheep-skins with machine printing or embossing to impart a finished grain to the surface. The goat-skins of Sokoto, the north-western district of the Northern Provinces of Nigeria, are locally regarded as superior to those of Kano and fetch a higher price in native markets, but they tend at present to find their way to America rather than to Europe.

A question raised in Parliament a few months ago elicited the reasons why our legislators sit on green "morocco" of European origin instead of on material of a similar nature contributed by Nigeria or other countries of the Empire. Nigerian skins average too small for furniture purposes, and comparatively few of those produced by the native are free from blemishes. These are mainly due to unskilled flaying and unhairing or to careless methods of tanning. The native leather worker is now being educated by the representatives of the various European and American firms interested in the product, so that if these fundamental defects can be remedied the extra durability of Nigerian leather might establish it, even as an upholstery "morocco," in the home market, where it is already valued for other purposes.

Another point requiring consideration is that the colour, or rather the depth of shade shown by red Nigerian leather varies very greatly. It should be mentioned that each hide is dyed separately, and this fact alone would account for the wide range of shade which results as compared with European methods in which numbers of skins are dyed together. Various degrees of texture and porosity of the individual skins also permit of great differences in the absorption of the dye.

Nigerian leather is in itself superior in wear, and when prepared under improved conditions, it should be at least equal in appearance to European "morocco."

The account here given of native methods of dyeing leather in Nigeria is based upon personal observations recorded some years ago, amplified by more recent notes sent by Dr. B. Moiser, of the West African Medical Service.

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The most familiar colour in which native goat-leather appears in Nigeria is red. For red leather either coarse skins or comparatively fine ones are used.

The two chief sources, perhaps in practice the only two, of this colour as applied to leather are (1) a red variety of *Sorghum guineense*, known as "karan dafi," and (2) aniline dyes.

"Karan dafi" is the Hausa name applied to a cultivated variety of *Sorghum* possessing leaf-sheaths and sometimes part of the stem tinged a deep red-purple colour. It is properly *Sorghum guineense* Stapf var. *robustum* Stapf. In the Upper Nile region the same material is said to be called "sikhtiyan," and other names at present in use amongst certain tribes of the Bahr-el-Ghazal are "bell" and "yunde." Chevalier * gives various native names from the French territories, of which the best known are "fara oro" in the Upper Niger region, and the Bambara "diélicanion" in western Senegal.

This colouration of the leaf-sheaths and stems, in lesser degree, often affects some of the wild species of *Sorghum*. For instance in *S. arundinaceum* Stapf, one of the gigantic grasses of Africa, the leaf-sheaths are not uncommonly more or less deeply flushed with a wine-red or deep purple stain; in *S. aterrimum* Stapf, known from French Guinea and from the Nile region, the leaf-sheaths are "strongly blotched or flushed with blackish-purple; ligules . . . blackish-purple".†

In addition a considerable proportion of the African species exhibit leaf-blades which are frequently enough tinged, blotched, or spotted in various degrees with red and purple. I have seen a native collecting the deeply-stained sheaths of *S. arundinaceum* ostensibly for use as a substitute for, or to mix with, the cultivated article.

"Karan dafi" is a grass, with erect contracted panicle, deeply-stained glumes and red grains, and has the general appearance of certain forms of Guinea Corn (chiefly *S. guineense*), the staple cereal of the open lands beyond the forest, but it is cultivated solely as a dye-plant and as such chiefly for leather, with occasional medicinal uses. The grain, indeed, is said to cause unpleasant symptoms if given to animals. Its cultivation in West Africa is mostly domestic around native dwellings, not in large fields, and it may be found all over the Western Sudan from French Guinea to Bornu.

The Hausas sometimes distinguish a "karan dafi bakki" (*i.e.* black), and a "karan dafi jaje" or "ja" (red), the former being the sheaths in their full development of dark black-purple colour, and the latter the same less mature or mixed with leaf-blades which may be more or less uniformly red or blotched. In the market the material appears as handfuls or small tied up bundles each containing 4–6 sheaths.

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* Revue de Botanique Appliquée, 1924: 352.

† Stapf in Flora Trop. Afr. 9, 1: 121.

The native method of application is as follows :—

1. A watery extract of wood ashes, known in Hausa as " toka," is prepared. In Sokoto at least, and perhaps in general amongst the Hausas and in Bornu, the wood of " marike " (*Anogeissus Schimperi* Hochst.), is preferred, and the ashes mixed with water are allowed to stand for 3 to 4 hours.

2. The dyestuff " karan dafi "—the red leaf-sheaths of *Sorghum*—pulverised in a wooden mortar, is placed in a large vessel in which the dyeing is carried out. A little of the " toka " water is added from time to time and diluted with plain water as desired, a crimson liquid being obtained.

3. The tanned hide has been previously dressed with oil, either ground nut oil or palm oil, and sometimes shea butter is used.

4. The dyeing may be done in one of two ways. The hide may be immersed, folded with the tanned side outwards, and manipulated in the large vessel for a minute or two, after which it is wrung out and shaken. On the other hand the dye-liquid may be merely painted with a brush or rubbed with the fingers on to the tanned surface.

5. The hide is then rinsed in cold water, which has been acidulated with lime juice, or in water in which tamarind pulp has been macerated for a few hours. After the hide has been hung up to dry, the process is completed by rubbing with a smooth stone on a wooden block.

It is estimated that a quart of the dye-bath is sufficient for about six skins of medium size.

The following native method was reported to me by a European who had witnessed it in Lagos. The ingredients were :—About 30 leaf-sheaths of " karan dafi " ; about a dessert-spoonful of " potash " (meaning the Hausa " kanwa " and therefore properly natron, see below) ; a handful of " sant " pods (*Acacia arabica*) ; two table-spoonfuls of palm oil ; two bottles of water (about 1½ pints). These were all mixed together and boiled. The addition of the juice of 5 or 6 limes naturally caused the ebullition of gas. The mixture was allowed to simmer for an hour or two, and was then ready to apply by brushing or rubbing on to the surface of the prepared skin. When dry it was further rubbed smooth by a stone or by pressing and drawing against an upright block of wood. In the absence of " sant " pods in Lagos, chips of mangrove bark—about 2 handfuls—were an available substitute.

In Bornu the wood-ash lye is replaced by " kanwa," which is the Hausa name for a sort of mineral salt, found as a natural deposit chiefly in the Manga district of the French Sudan north of Lake Chad. Amongst Europeans this is loosely classed with several other native salts as " potash," but it consists largely of sodium carbonate and bicarbonate and is therefore a natron.

In Senegal, according to Dumas* and Chevalier†, the extraction of the dye is by prolonged maceration of the sheaths in water, and a

* L'Agric. Prat. Pays Chauds, 5, 1 : 461.

† Rev. Bot. Appl. 1924 : 353.

mordant of vegetable ash is used in applying the dye-bath to the material to be treated. Presumably the maceration would be expedited by a preliminary boiling. In the Hausa method the alkaline lye serves both to extract the dye from the pulverised raw material and as a mordant in one operation.

The chemical constitution of the vegetable ashes called by the Hausas " toka," if this were prepared always from the wood of the same species of tree, might be expected to be fairly uniform. The soluble constituents of wood-ashes are generally represented as mainly potassium carbonate along with sodium carbonate and smaller amounts of potassium chloride and sulphate, while amongst the insoluble contents quicklime (CaO) often occurs in considerable quantity. Tropical woods, on the other hand, often yield an ash rich in potassium nitrate. Again, " toka " in Northern Nigeria is sometimes made by burning the sludge from indigo dye-pits or other refuse from the dyeing and tanning industries, generally mixed with the wood of *Anogeissus* or of one or other species of *Acacia*. Thus the lye from the native crude material may vary considerably in chemical content.*

The active dye-stuff of " karan dafi " has been stated to be of the same type as that of the so-called " insoluble red-woods " such as red sandal-wood and the African red-woods (*Baphia nitida, Pterocarpus Soyauxii, P. Osun,* &c., *K.B.* 1906, p. 373; 1910, p. 329), viz. " santalin " or " santalic acid." It is easily extracted from the pulverised leaf-sheaths by alcohol, giving on evaporation a very dark-red powder. If acidulated alcohol is used the resulting extract is a more brilliant and attractive red.

The action of the alkali used in preparing the dye necessarily modifies the shade, probably in the direction of violet, but the original red is restored by the dilute vegetable acids of the native process. Again, the alkali, whether from vegetable or mineral sources, doubtless forms the mordant in the above process, and as purity of these materials is on the whole unlikely the resulting tints may lack uniformity. Particularly is this likely to be the case where the water itself varies in chemical quality. Thus in Sokoto some of the wells are believed to tap the limestone, while elsewhere a ferruginous element is common; neither lime nor iron as an ingredient in the solvent water is favourable to the extraction of a perfect red dye. On the other hand as a mordant the presence of iron in the water might be of considerable importance in altering and fixing the tint. Possibly some such differences account for the statement of Volkens†, referring to " karan dafi " as used in

* A white alkaline powder sent from Bornu in 1910 to the Imperial Institute as a sample of " toka " was found to contain, besides about 66 per cent. of silica, chiefly quicklime—18·45 per cent. (Bull. Imp. Inst. 1910: 403). An excess of inert silica in the form of sand might be expected from the refuse of indigo dye-pits and from the use of muddy water. There was a complete absence of soluble alkali and the sample was probably spent " toka " from which all the soluble lye had been extracted by its previous use.

† Notizbl. Bot. Gart. Berlin, App. 22, 3: 71 (1910).

Togoland, that the extract used alone dyes red but with " trona " (which is the same as " kanwa "), it stains black.

Many species of *Sorghum* have the inflorescence, glumes and grains more or less deeply tinged from wine-red to black-purple. This natural pigment has been called " sorghorubin," and is probably the same as that of the leaf-sheaths. It can be extracted by cold alcohol or by boiling water, in either case colouring the solvent garnet-red, or by acidulated boiling water, giving orange-red. It is also soluble in alkaline solutions, giving different colours, violet, &c. The dye thus extracted can be used with different mordants to give various shades. This colouring matter, obtained particularly from the saccharated varieties, has been subjected to practical investigation in France in the dyeing industry for application to silk, wool and cotton.* Piédallu†, in fact, shows that the dye extracted from the glumes could be used for glove leather in a variety of tints according to the solutions of metallic salts used as mordants.

Amongst the Hausas " karan dafi " as a dye appears to be applied almost solely to leather and sometimes to fibres used in weaving mats. Throughout West Africa other articles are dyed with the same material, such as cloth fabrics and ornamental gourds, and in some places it is used as a body paint (*K.B.* 1891, p. 219.) Apart from leather the materials most extensively subjected to this dye are the strips of palm leaf or bast, and the grasses used for the finer varieties of mats, a usage which, like the application to leather, is found over a very wide area to North Africa and across to the Eastern Sudan. In the Western Sudan Chevalier‡ states that it is also used to dye the wool of the Macina sheep for the embroidery in red-brown and amaranth shades which decorates the cloths and rugs of Djenne and Timbuktu.

Barwood and Camwood (which are merely trade names for certain species of *Baphia* and more often of *Pterocarpus*), have been stated to be used in Nigeria as red leather dyes, and it is possible that they may be so applied, but there appears to be no definite record of such use. The usual native applications of these redwoods, at one time used in Europe in admixture with other dyes and with mordants chiefly for wool, are as a body paint and sometimes for cotton fabrics.

The flowers and red-veined leaves of *Gossypium arboreum* L. var. *sanguineum* Watt (a variety of the cotton plant known in Hausa as " kanawa "), yield dyes. That of the flowers is referred to under black leather dyes. The Hausas use the crushed leaves along with lime juice as a red dye for cotton thread, and are said to use it in general like " karan dafi," but I have not found any definite record of its application to leather.

The use of imported aniline dyes for Hausa leather is common, and magenta crystals have long been familiar in native markets for use

* Sichard, " Monographie de la Canne à sucre de la Chine, dite Sorgho à sucre," Chap. 18 and 19, 2nd Ed., Paris, 1858; and Piédallu, " Le Sorgho, son histoire, ses applications," Paris, 1923.

† l.c. p. 340.

‡ Revue de Botanique Appliquée, 1924: 540.

in dyeing other articles as well as goat-skins. A solution of the dye is simply painted on the tanned hide.

In Morocco goat-leather is at present dyed red largely by imported European dyes, but the older methods using native madder (*Rubia peregrina*), with alum as a mordant, and by cochineal imported from the Canary Islands, are also still employed.

At the same time the use of tinctorial Sorghums is perhaps not unknown. In Algeria, certainly, *Sorghum* is used for dyeing both leather and wool. Also the Bulrush Millet (*Pennisetum typhoideum* Rich.), includes several varieties in which the inflorescence, but not the leaf-sheath, is coloured red or violet, and Trabut* mentions a purple-stained variety of this cereal—called in Algeria " tafsout hamra "—which is applied for the same purposes. The articles to be dyed, leather or wool, are passed through a solution of alum and then soaked in a warm decoction of the dyestuff " tafsout." In this instance the mordant precedes the dye. The use of alum, as a mordant with *Sorghum* dye for glove leather, is stated by Piédallu to give " vieux rose " tones, and, when alum is used as a preceding mordant on cotton, dove-colour with more or less violet tints is obtained.

Yellow Leather Dyes.

In considering the yellow-dyed leather of the Hausas the native word " gangamau " is in frequent use and requires a note of explanation. The word is applied to at least three kinds of yellow dye, and in some cases by inference to the plants which produce them. One of these is an Asclepiad quite recently ascertained to be *Cryptolepis sanguinolenta* Schltr., which appears to have no alternative name in Hausa. Another is turmeric, *Curcuma longa* Linn., but this has another native name, " zabibi," and the word " gangamau " as applied to it probably refers to the dye rather than to the plant itself. The following incident, however, is of interest. In 1906 an Indian bullock driver in N. Nigeria attached to the waggon transport, in trying to obtain the ingredients to make a curry powder found all but the usual colouring agent. On arrival at Kano he recognised in the market the required turmeric root sold under the name of " gangamau." The yellow dye produced from the leaves of *Anogeissus Schimperi* Hochst. is also sometimes referred to as " gangamau," but the plant itself has a quite different native name.

Hausa leather is usually dyed yellow by the use of one of the above. Occasional use may at times have been made of some other yellow dyes of vegetable origin, amongst which may be mentioned *Cochlospermum tinctorium*, *Sarcocephalus esculentus* and *Enantia polycarpa*. Lastly an imported artificial yellow dye is used in some localities. Comparatively fine skins are generally selected for yellow shades.

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* Revue de Botanique Appliquée, 1924 : 540.

1. *Cryptolepis sanguinolenta* Schlechter (*C. triangularis* N.E. Br., *Asclepiadaceae*), is a woody twiner and climber with a distribution from Gambia to Angola. The fresh sap (of specimens raised from seed at Kew, 1925), is orange-red and resinous, and the stem and root show a bright-yellow section. Mature follicles, which do not appear to have been described previously, have been received recently, collected by Dr. Moiser in Sokoto Province, Northern Nigeria. They are linear-terete, glabrous, striate, 5–8 inches long with a hooked beak.* The fractured base of the follicle shows, in the samples received, a dried red resin. The root appears in native markets as cylindrical, sometimes slightly tortuous pieces, yellow when cut across, and more or less corrugated longitudinally.

This plant was originally described as *Pergularia sanguinolenta* Lindl., and was raised at Chiswick in the Royal Horticultural Society's gardens from seeds brought from Sierra Leone by G. Don in 1822. The only native name for it known at present is the Hausa "gangamau."

The following description of the dyeing process with this material is abstracted from notes taken by Dr. Moiser in the course of observations in Sokoto. The ingredients used are the roots of *Cryptolepis* and the fruit of tamarind, *Tamarindus indica* Linn. The roots are crushed and ground in a wooden mortar, and a little hot water added with stirring. This extract is of a dull-yellow colour and must be freshly made for immediate use. Tanned goatskins are used and the tanned surface is rubbed over with a cloth dipped in a little groundnut oil. The hide is then folded in two, the tanned surface outwards, and dipped in the pot containing the dye-bath, the extract being well rubbed into the surface with the hands. After a few minutes a piece of tamarind paste is added and the mixture again rubbed in. The tamarind paste is prepared from the entire pods, complete with seeds and pulp, soaked in cold water and then gradually warmed in a vessel over the fire to a temperature that can well be borne by the hand. The soft pulpy mass is then wrapped in leaves and kept for use.

The skin is removed from the pot by a sort of circular motion through the fingers, which has the effect of removing most of the mixture, and is then opened out and shaken and exposed to the air for 2 or 3 minutes, any adhering moisture being wiped off. This exposure to the air is regarded as an important item in the process. The skin is then returned to the vessel and the mixture again rubbed in for about 5 minutes, after which it is wiped clean and hung up to dry.

The effect of the tamarind pulp in the above process is probably to purify the colour, and it removes the red tint, which would be developed if any alkali had been used in preparing the dye-bath.

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* In the Catalogue of Welwitsch's African Plants, vol. 1, 3 : 677, under *Cryptolepis triangularis* N.E. Br. occurs the note, "There is in the study set a unique follicle, probably young, which is narrow, hooked at the tip, 1 in. long and sparingly lepidote-puberulous."

2. *Curcuma longa* Linn. This, the turmeric of the East, is fairly well known in West Africa and is cultivated along with ginger in the forest regions. In the open country north of the forests it is common enough in native compounds and seems to be cultivated almost solely for use as a dye. It was probably introduced to Nigeria by Arabs via Lake Chad, as the name in Bornu (Kanuri language), is " kurgum " (" kurkum " being one of its names in Arabic). In Hausa it is known as " zabibi " and " gangamau."

Samples of the root, sent under the latter name at different times to the Imperial Institute (no. 30472 of 10/6/09 in Herb. Kew.), and to Kew (1921) have been determined as *Curcuma longa* Linn. A sample of sliced root sent by Dr. Moiser under the name " zabibi " came from Zaria in N. Nigeria and was similarly identified. It corroborates the name " zabibi " for *Curcuma* accompanying a flowering specimen from Abinsi on the Benue River in 1912 (Herb. Kew. *Dalziel* 828, and in Hausa Botan. Vocab. p. 105).

The method of use in its simplest form is merely to make a paste of the pulverised turmeric root with water, and rub it well into the tanned hide after lightly oiling the surface. The skin is then washed with a weak mixture of lime juice and water and dried in the sun.

In Bornu it is said that the hides to be dyed yellow are not oiled, and that the dyestuff is prepared for use by mixing with water and the native mineral " kanwa," which, as stated above, is a mixture of sodium carbonate and sodium bicarbonate. This alkali necessarily turns it almost red, but the colour is purified to yellow by the usual wash of lime juice and water. In Sokoto *Curcuma* is used as a dye for cloth, by a process identical with that above described as applied to leather treated with *Cryptolepis*, along with tamarind pulp and hot water.

Turmeric is recognised in the dyeing industry as one of the " Direct Colours " (*i.e.*, capable of dyeing cotton without a mordant). Applied to cotton, wool or silk it is used in a weak solution of acetic acid or alum. It is probable that the *Cryptolepis* dye may be found to be of the same nature as turmeric.

3. *Anogeissus Schimperi* Hochst., and *A. leiocarpus* Guill. & Perr. (*Combretaceae*). Two species have been confused under the name *A. leiocarpus* Guill. & Perr., and the majority of specimens in the Kew Herbarium belong to *A. Schimperi* Hochst., which ranges from the Senegal coast to the eastern Sudan and Upper Nile region. *A. leiocarpus* proper seems to be limited to the far western part of the Sudan from Mauritania to French Guinea. Under this distribution the Hausa name " marike " refers to *A. Schimperi*, but it is probable that the economic properties are common to both species.

The tree " marike " is a very common one throughout the Sudan and its medicinal and other domestic uses are familiar to the natives all over that area. In Nigeria (Hausa and Bornu), the wood-ashes are used as a dehairing agent, for hides, and by the Yorubas as a mordant for *Lonchocarpus* indigo. The leaves, roots and bark all seem to contain tannin and are sometimes used in different localities

for tanning goat-skins.* A yellow dye is derived from the leaves. According to Chevalier the tree is actually planted near villages in Dahomey because of its tinctorial properties†, and also amongst the Bambaras in Senegal the leaves are employed for this purpose.

In dyeing leather the Hausa method employed is to wash the tanned skin in a cold infusion of *Anogeissus* leaves as the dye, to which has been added a solution made from a native earth or clay which doubtless acts as a mordant. The process as noted by Dr. Moiser is as follows :—(*a*) dried leaves of " marike " are pounded in a wooden mortar, water is poured on and allowed to stand overnight. (*b*) " ashauma," a sort of clay obtained from the hills at Wurno (some 20 miles N.E. of Sokoto), is mixed with water and made into flat cakes and sun-dried. Some " ashauma " is placed in a bowl and a little water added and allowed to stand for a couple of hours ; the clear fluid is then decanted for use.

The " marike " leaves are removed from the dye-solution, which is now divided into two parts in two bowls. A little of the " ashauma" water is added to one and the skin is steeped in this and stirred with the hands for about one minute. It is then removed, shaken, and placed in the second bowl to which a little " ashauma " water has been just previously added. The skin is stirred in this for a minute, then removed, wrung through the hands, and hung up to dry. The dye-solution cannot be used twice.

A goat-skin, dyed yellow by the above method, is on exhibition in Museum No. 1, at Kew. The " ashauma " or " ashoma " is sold in native markets at about a penny per cake and is used medicinally as well as in dyeing. When broken up it appears as granular friable pieces of a whitish or dirty greyish-brown colour according to its purity or admixture with soil. Its soluble constituents have been found to consist chiefly of aluminium sulphate along with sulphates of magnesium and calcium.‡

The presence of aluminium sulphate (forming 5·2 per cent. of the crude earth), accounts for its use as a mordant in the native method described. This application is of course, in the circumstances, purely empirical, and represents what in primitive races must have been the first advance, from the simple use as dyes of fruit juices and vegetable infusions, to the discovery that a permanent stain could be attained by mixing them with native earths containing iron or alumina.

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* In India a liquid extract of the leaves of *Anogeissus latifolius* Wall. is used for tanning, and a black dye can also be obtained from the leaves.

† Chevalier—Bull. Soc. Acclim. 1912 : 105.

‡ Through the courtesy of Dr. T. A. Henry I am indebted to Mr. J. A. Goodson, F.I.C., of the Wellcome Research Laboratories, for the analysis of a small sample of " ashoma " as follows :—" The material soluble in water was examined and found to have the following percentage composition :—

Aluminium sulphate $Al_2(SO_4)_3$	59·6
Calcium sulphate $CaSO_4$	7·7
Magnesium sulphate $MgSO_4$	11·2
Water not lost at 100° C., organic matter and undetermined	21·5

The material is free from chlorides and nitrates." J. M. D.

Some other plants which yield yellow dyes have been stated to be used sometimes for leather as well as for other materials. They deserve no more than passing notice.

4. *Cochlospermum tinctorium* A. Rich. A yellow dyestuff is obtained from the roots by boiling and is used, perhaps all over the savannah regions of West Africa where the plant grows, for dyeing cotton (*K.B.* 1921, p. 245). The Hausas apparently do not use it for dyeing leather, or only rarely, but Pobéguin*, while making no reference to cotton, mentions it as a leather dye in French Guinea. This species is referred to again under green leather dyes.

5. *Sarcocephalus esculentus* Afz., a West African forest tree, has a yellow wood of little value as a dye. The shrubby form of this in the more open country is known as var. *Russegeri* Havil., and is called in Yoruba "agbesi." The yellow root yields a dark-yellow dye which has been used for the coarser grades of native leather but is of comparatively little importance.

6. *Enantia polycarpa* Engl. & Diels, is an Anonaceous "Yellow Wood" which grows in Sierra Leone. Afzelius' specimen in the British Museum Herbarium bears the legend "a yellow dye wood containing berberine." The bark, which has been known under the name of "Abeokuta Bark", also yields berberine and in West Africa "an extract is used for dyeing skins and mats." This statement is referred by Holland† to The Technologist, 1865, 562, where mention is also made of the fact that the bark and root of the common barberry (*Berberis vulgaris*) yield the same alkaloid and are used in parts of Europe for leather dye as well as for woven fabrics, &c.

7. Imported dyestuff. Various aniline dyes are commonly sold in native markets. An artificial yellow dye has been in use for leather for a considerable number of years in the upper Benue region, Yola and the adjoining parts of North Cameroons, but, although the practice has probably extended to other areas, it is apparently not or only rarely applied for this purpose by the Hausas proper. The method is simple, the powder being mixed with water and rubbed or painted on the tanned skin, which is not oiled before the application. In Morocco, where aniline dyes are now used for most colours, the yellow dye for goat-skin leather is still obtained from pomegranate rind, gathered unripe and sun-dried, along with alum.

Green Leather.

The green tints on Hausa leather are obtained in three ways :—

1. Copper or brass filings with a mineral salt. In this method three peculiar features are to be noted. Firstly, sheep-skins are used, apparently because they are lighter and thinner than goat-skins; doubtless also because they are more porous in texture than goat-skins, which are altogether tougher and finer in grain. It may be

* Pobéguin, Flor. Guinée Franç. 163.

† Holland, The Useful Plants of Nigeria, Kew Bull. Add. Ser. 9, 1 : 51.

mentioned that the pelt of the Nigerian sheep is hairy not woolly. Secondly, the application is made on the fleshy side and not on the outer surface of the hide.* Thirdly, the hide is not tanned.

The general principle of application is as follows :—The skin is first subjected to the usual processes which precede tanning by the native methods, *i.e.* unhairing by soaking in a solution of wood-ashes (preferably of *Anogeissus Schimperi*), followed by a bating bath composed of a decoction of the plant " serri " (*Daemia cordata* R. Br., *Asclepiadaceae*). After scraping, pulling and stretching to render it soft, pliant and absorbent, the skin, instead of being tanned in the usual course, is ready for the green dye, of which the chief ingredients are brass or copper filings and a white mineral salt called in Hausa " sunaderi." The latter is now known to be almost pure ammonium chloride, and is used in Northern Nigeria in native methods of brazing and welding metals. Common salt is sometimes an additional ingredient, and to these substances, mixed in an earthenware pot or large calabash, is added either a cold infusion of tamarind pods or some fresh lime juice generally mixed with sour milk. Some of a previously made preparation having been added to the fresh ingredients, the mixture is stirred with a swizzle stick, not with the hands, and becomes bright-yellow rapidly turning to green. The resulting dyestuff can be kept for use in the form of a paste.† The skin is stretched tightly, flesh side upwards, on pegs at a height of a few inches from the ground. The paste is poured on the centre of the exposed surface of the skin and distributed in a thick layer by means of a shell. If any rubbing takes place the operator is careful to cleanse the hands immediately, as the paste causes a deep-black staining of the nails which is difficult to remove. The stain penetrates to the outer or hair surface of the skin, after which the dyestuff is removed, the skin is wiped with a little water and hung up or laid out to dry.

According to Dr. Moiser, who observed it in Sokoto, this process is known in Hausa as " almoaza " ; the procedure differs from the alternative method described below in being carried out in the open air and not in a hut ; instead of rubbing the dye-paste in by hand a thick mat is arranged to cover the skin stretched on pegs, and after about three hours when the staining is complete the paste is removed and the skin is wiped and hung up to dry.

The alternative method is held in higher esteem by the Hausas and is called " dawul." In this process tamarind pulp is not used and the proceedings take place under cover, generally inside a hut. The ingredients used are :—brass or copper filings : " sunaderi " (ammonium chloride) : a native mineral salt called " balma " : sour

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* In European practice buckskin, chamois and Suède used for glove leather are dyed from the flesh side (Piédallu l.c. 431).

† The use of old dye-liquors to ensure an even colour free from streaks and patches on animal fibres is familiar in the case of those dyestuffs which are applied in an acid solution to wool and silk and also to leather (" acid colours ").

milk : some of the residual green powder kept from previous use and called " zamzari."

The salt, " balma " or " bilma ", is a commercial commodity brought from Bilma in the French Sahara north of Lake Chad ; it consists chiefly of sodium chloride and sulphate with smaller amounts of potassium chloride and sodium carbonate. Dr. Moiser's account is here mainly followed :—The ingredients are measured, $5\frac{1}{2}$ parts of " zamzari " are placed in a bowl with 1 part each of filings," sunaderi " and " balma " ; to the mixture is added sour milk and the whole is stirred to the consistency of thick cream. The untanned skin, scraped clean of excess of moisture, etc., is stretched very carefully until quite taut on a wooden frame about $2\frac{1}{2}$ feet square, which is laid horizontally and supported at each corner on a small stone. The flesh side being upwards the mixture is poured on at the centre, spread evenly over the surface by means of a shell and rubbed in fairly vigorously for a few minutes. A little sour milk is then added and the rubbing continued for a quarter of an hour, by which time the stain has begun to appear on the outer surface. The middle line of the back where the skin is thicker appears as a pale line. The finger is pressed along this streak and a little of the " sunaderi " and " balma " are sprinkled on it. A little water is added from time to time, a shellful at a time, and gentle rubbing with the back of the shell is continued, until the pale streak is obliterated and coloured like the rest of the skin. The frame is then lifted and shaken horizontally, to distribute the fluid evenly over the surface, and then replaced, the whole process having taken about an hour.

The finishing touch is curious and from the native point of view important. A small piece of iron is placed at the centre of the skin and pressed into it to remain until the dye-mixture is scraped off next morning. A closely woven grass mat, fixed on canes, serves to cover the skin on its frame, which is allowed to remain overnight and is then placed outside for 3 or 4 hours to dry. The dyestuff, now a dry powder, is scraped off with the edge of the shell, the skin is detached from the frame and its edges trimmed. A small brown spot is seen at the centre of the skin where the iron was placed, and this is a " trade mark " peculiar to the " dawul " process, which is regarded as a more lasting method. In Hausa law it is an offence to put a similar mark on a skin dyed by the " almoaza " method.

The dry blue-green powder, which is scraped off the skin at the end of the dyeing process, is called " zamzari." It is washed with several changes of clean water in a small vessel and then dried and kept for future use as one of the ingredients of the dye. The water used in these washings is carefully collected and allowed to deposit a greenish sediment, which is dried and sold in markets in the form of small green-pea-like pellets. This, known in Hausa as " korino ", —a name used also for the green leather itself—is a reputed medicine for eyes, ulcers and skin diseases.

2. Imported aniline green is commonly sold in Hausa markets, and as its application (to the outer or hair side of the skin), is much

simpler than the native process it is frequently used. In Bornu it seems to have been for many years the only green dye for leather.

3. Compound shades of green are obtained by a mixture of vegetable dyes, namely, indigo and yellow dye. As regards the latter, both turmeric and the root of *Cochlospermum tinctorium* have been used, and the indigo so far as recorded observation goes has been *Lonchocarpus cyanescens*. Millson* refers (though not specifically to leather), to the combined use of " elu " (*i.e.*, *Lonchocarpus* indigo), with *Cochlospermum tinctorium* in " making the sacred green dye, which is a secret trade of certain Hausa families," but, although such an industry may be to some extent hereditary, there does not seem, at the present time at least, to be anything secretive in the method or materials (*K.B.* 1891, p. 219.) The methods with brass filings and synthetic aniline dye are those in most common use, but various tints from bluish to bright green may be seen in market leather, and with three native yellow dye plants (*Cryptolepis*, *Cochlospermum* and *Curcuma*), along with two forms of indigo (*Indigofera* and *Lonchocarpus*), it is probable that various combinations are made.† As a rule the lighter goatskins are used for the green and bluish shades.

Black Leather Dye.

In the native Hausa process the essential ingredients are iron, in the form of blacksmith's slag, with sugar or honey and a vegetable material containing tannin; the resulting black dye is called "kuloko." Tanned hides are used and may be either coarse or fine.

The refuse slag iron from the blacksmith's charcoal furnace (known in Hausa as " kashin mukira " or " kwan mukira "), or the scum of molten iron (" kashin tamma "), probably consists mainly of fused oxide of iron and carbon. Small pieces of iron or tin or iron ore may be added. " Sant " pods (*Acacia arabica*), uncrushed and in unlimited quantity, are placed, along with the iron material, in a pot with water and left for about 3 days to ferment. The dark fluid is concentrated by boiling and before use either honey or loaf sugar is added.

In Sokoto, according to Dr. Moiser's observation, the ingredients used were as follows:—blacksmith's iron refuse; the ripe hard fruit of the " goreba " palm (*Hyphaene Thebaica*); limes, ripe or unripe; bones; tin or iron in small pieces; water in which Guinea-corn has been boiled. These are all mixed in a pot and allowed to remain for 3 days.

The skin is dyed over the whole surface or in stencilled patterns, the dye being applied by a piece of leather or a wisp of straw.

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* Kew Bull. 1891: 219.

† In India compound green shades are obtained from turmeric with indigo (*Indigofera*), fabrics being dyed first in indigo and then dipped in a solution of turmeric; also to a mixture of turmeric with pomegranate rind and alum is added indigo, giving a greenish yellow colour (Watt. Dict. Econ. Prod. India, 2: 666–7).

In North Dahomey a black stain for leather is obtained from the wine-red flowers of a variety of the cotton plant (*Gossypium arboreum* L. var. *sanguineum* Watt), which is cultivated in villages for that purpose.*

A fine black stain for leather is obtained in West Africa generally from an imported artificial dye, and a simple crude black colouring by the use of Indian ink is also common.

Blue Leather Dye.

Blue dyes in Nigeria are obtained almost entirely from plants which yield indigo, namely, *Lonchocarpus cyanescens* Benth. (*K.B.* 1921, p. 242; Add. Ser. ix, p. 244) and several species of *Indigofera* (*K.B.* 1888, p. 74 and p. 268; 1890, p. 242; Add. Ser. ix, p. 190). The subject is too extensive to be included here and will be dealt with in a later paper.

XXXI.—DECADES KEWENSES Plantarum Novarum in Herbario Horti Regii Conservatorum. DECAS CXIV.

With the completion of the Flora Capensis and the Flora of Tropical Africa as far as the grasses, the need for the series of **Diagnoses Africanae** no longer exists (*K.B.* 1894, p. 18). New species of African grasses and economic and botanical notes bearing on them will appear in a series entitled **Notes on African Grasses,** whilst new species and notes connected with the African Regional Floras will appear under separate series bearing the name of the flora to which they relate. Occasional new African species other than the above will in future be published under the **Decades Kewenses.**

1131. **Hugonia trigyna** *Summerhayes* [Linaceae]; ab omnibus speciebus stylis constanter 3 valde distincta.

Frutex alte scandens; ramuli teretes, striati, juventute pilosi, maturi glabri, pallide brunnei, lenticellis albidis sparse induti. *Unci* sub inflorescentia geminati, pubescentes, circinati. *Folia* ad apicem ramulorum plus minusve conferta, alterna, 3–5 mm. petiolata, petiolo gracili sparse brunneo-pubescenti; laminae oblanceolatae, apice acutae et minute apiculatae, basi cuneatae, 3·5–5·5 cm. longae et 0·9–1·6 cm. latae, remote et minute denticulatae, chartaceae, utrinque costa pilosa excepta glabrae; costa utrinque prominens, nervis lateralibus circiter 9 arcuatis anastomosantibus, nervis tertiariis numerosis reticulatis utrinque prominentibus; stipulae profunde 4-partitae, laciniis linearibus vel anguste lanceolatis, appresse hirsutae, usque ad 5 mm. longae. *Flores* in axillis foliorum solitarii, 1–1·5 cm. pedicellati; pedicelli graciles, medio articulati, glabri, inferne bracteolati, bracteolis 4–5-fidis stipulis subsimilibus; sepala basi connata, ovata vel

* Réteaud in Revue de Botanique Appliquée, 1924: 211.

elliptico-ovata, 3·5–5 mm. longa, ciliata, extra glabra, intus breviter sericeo-pilosa; petala oblongo-spatulata basi in unguem angustum exeuntia, flavida, sepalis 4-plo longiora; stamina 10 in tubum sepala fere aequantem connata, 5 dimidium petalorum superantia, 5 breviora, antheris 0·75 mm. longis; ovarium ovoideum, glabrum, stylis 3 supra medium separatis stigmatibus crassis coronatis. *Fructus* non visus.

Tropical Africa. Portuguese East Africa: climber on trees, Nov., *C. E. F. Allen* 76.
Vernacular Name: Untalabula (Makua).

1132. **Ochna confusa** *Burtt Davy & Greenway* (Ochnaceae); species affinis *O. leptocladae* Oliv., sed habitu robustior, cortice cinerascente pustulato epidermide membranacea decidua, sub anthesi jam foliata differt.

Frutex glaber, lignosus, circiter 1 m. altus; rami virgati, cortice cinerascente pustulato, epidermide membranacea, sub anthesi plus minusve foliati. *Folia* juniora breviter petiolata, 2–5 cm. longa, 0·8–1·2 cm. lata, lanceolata, subacuta, basi attenuata, serrata; folia matura breviter petiolata, plus minusve coriacea, supra atroviridia, infra pallidiora, 5–10 cm. longa, 1·2–2·7 cm. lata, oblanceolata, interdum lanceolato-elliptica, apice rotundata vel obtusa, in petiolum attenuata; costa utrinque prominens, nervis lateralibus distinctis. *Inflorescentia* in ramis abbreviatis umbellata, plerumque 3–4-flora; pedicelli graciles, 1·3–1·8 cm. longi, basi articulati. *Sepala* 7–8 mm. longa, 5 mm. lata (fructu 15 mm. × 5–9 mm.) pallide viridia, demum purpurea, ovata vel elliptica, apice rotundata. *Petala* 10 mm. longa, 5 mm. lata, apice rotundata, basi in unguem attenuata. *Filamenta* 4 mm. longa; antherae 2 mm. longae, oblongo-lineares, longitudinaliter dehiscentes. *Fructus* subglobosus, 8 mm. diametro.

South Africa. Transvaal: Lydenburg District; Pilgrims Rest, 1400 m., fl. Oct., *Rogers* 23068! Barberton District; Barberton, fl. Nov., *Rogers* 18264! (Types in Herb. Rogers.)

1133. **Swainsonia lessertiifolia** *DC.* in Ann. Sci. Nat. sér 1, iv. 99 (1825) [Leguminosae - Galegeae]; descriptio ampliata auctore V. S. Summerhayes.

Caulis (unicus exstans) erectus, herbaceus, longitudinaliter striatus, pilis appressis basifixis usque ad 0·8 mm. longis plus minusve dense indutus. *Folia* imparipinnata, usque ad 18·3 cm. longa; rhachis densiuscule appresse pilosa; petiolus circiter 1 cm. longus; foliola circiter 7-juga breviter petiolulata, elliptico-oblonga vel oblonga, apice obtusa vel rotundata, rarius subacuta, 8·5–15 mm. longa, 3·2–5·6 mm. lata, juventute dense cano-sericea, demum supra glabra subtus pilis appressis brevibus basifixis induta, costis supra prominentibus subtus impressis; petioluli 0·4–0·8 mm. longi. *Stipulae* late ovatae, 3·2–4·5 mm. longae, subscariosae, apice rotundatae, ciliatae, extra appresse pilosae. *Racemi* axillares, circiter 11–15-flori, usque ad 19·5 cm. longi, pedunculis

usque ad 14·5 cm. longis sparse vel densiuscule appresse pubescentibus; bracteae ovatae, acutae, 1·2–1·7 mm. longae; pedicelli 1–2 mm. longi, dense nigro-brunneo-pubescentes. *Flores* circiter 1 cm. longi. *Calyx* in toto 3·5–4·5 mm. longus, utrinque nigro-brunneo-pubescens, lobis 5 anguste deltoideis acutis 1–1·4 mm. longis. *Vexillum* et *alae* desunt. *Carina* oblique ovata, apice rotundata, 9 mm. longa, 4 mm. lata, inferne auriculata, ungue 3·2 mm. longo. *Filamenta* 6·5–6·8 mm. longa; antherae ovatae, 1–1·2 mm. longae. *Ovarium* lanceolatum, 5·5 mm. longum, subsericeum; stylus incurvatus, circiter 6 mm. longus, intus longitudinaliter barbatus; stigma minutum. *Legumen juvenile* oblongo-lanceolatum, 10–12 mm. longum, 3·1–4 mm. latum, acuminatum, dense brunneo-pubescens.

AUSTRALIA. "Nouvelle Holland, côte mérid. Mus: de Paris 1821" (Herb. Delessert).

1134. **Mucuna Lane-Poolei** *Summerhayes* (Leguminosae-Phaseoleae); affinis *M. Schlechteri* Harms, a qua caulibus appresse pilosis, foliis minoribus, inflorescentia brevissima et pedunculis pilosis differt.

Frutex scandens; caules volubiles, tenues, brunnei, leviter longitudinaliter sulcati, pilis longis retrorsis appressis sparse praediti. *Folia* trifoliolata; rhachis 3·9–5·7 cm. longa, supra canaliculata, appresse pilosa; foliola lateralia oblique lanceolato-ovata, 6·3–7·7 cm. longa, 1·9–2·5 cm. lata, longe acuminato-caudata, basi obtuse cuneata vel subrotundata, 3–5 mm. petiolulata; foliolum terminale anguste ellipticum, 7·4–8·7 cm. longum, 2·2–2·8 cm. latum, longe acuminato-caudatum, basi cuneatum, 4–6 mm. petiolulatum; foliola subchartacea, margine plana, leviter undulata, supra glabra, subtus praesertim ad nervos appresse pilosa; costa utrinque prominens; nervi laterales utrinsecus 3–5, arcuati, prope marginem conjuncti; petioluli supra canaliculati, dense longe appresse pilosi, subtus appresse pilosi, demum glabri; stipulae lineari-subulatae, 2–3 mm. longae, pilosae; stipella filiformia, 2–3 mm. longa. *Inflorescentiae* breves, pauciramosae, pedunculo 2·5 cm. longo; rami 4–5 mm. longi, biflori. *Flores* 2·5 cm. longi, 7 mm. longe pedicellati. *Calyx* 4-dentatus, utrinque dense et longe appresse pilosus; tubus 6 mm. longus; lobus superior late triangularis, 4 mm. longus, basi 9 mm. latus; lobi inferiores anguste lanceolati, acuti, 4–5 mm. longi. *Vexillum* ovato-ellipticum, breviter unguiculatum, apice parum emarginatum, supra unguem rotundato-auriculatum, 2 cm. longum, medio 1·4 cm. latum, intus inferne sparse appresseque pilosum. *Alae* anguste oblongae, superne versus apicem per 9 mm. oblique angustatae, uno latere unguiculatae, inferne longiuscule sericeo-ciliatae, lamina 2·2 cm. longa, unguibus 3 mm. longis. *Carinae* petala cultriformia, apice incurva, uno latere unguiculata, glabra, lamina 1·9 cm. longa, unguibus 6 mm. longis. *Stamina* 10, connata; filamenta linearia, circiter 2 cm. longa, 0·5–0·7 mm.

lata; thecae antherarum basifixae, oblongae, 5 longiores, 1·8–2 mm. longae, leviter barbatae, 5 breviores 1 mm. longae, inferne longe barbatae. *Ovarium* anguste obovoideum, compressum, 6 mm. longum, dense appresseque brunneo-hirsutum; stylus 1·9 cm. longus, inferne hirsutus, superne glaber, stigmate capitato coronatus. *Fructus* non visus. *Semina* nigra, 1·4–1·8 mm. longa, 1·1–1·5 mm. lata et 0·5–1 mm. crassa, laevia, minute punctata.

New Guinea. Owen Stanley Range, 1800 m., Feb. 23rd, *E. Stanley* in *Lane-Poole* 372.

1135. **Inga** (§**Leptanthae**) **Bollandii** *Sprague & Sandwith* [Leguminosae-Ingeae]; affinis *I. ciliatae* Presl, foliolis 1–2-jugis supra opacis, costa juventute excepta supra glabra nec setulosa, alabastris superne crassioribus, calycis dentium breviorum sinibus subtruncatis, corollis brevius sparsius indutis quam calycibus plusduplo longioribus differt.

Ramuli graciles, setulis fulvis patule ascendentibus hirsuti, densiuscule lenticellati, circiter 1·3 mm. diametro 10 cm. infra apices. *Folia* petiolata, 6–11 cm. longa, foliolis 1–2-jugis; stipulae subulatae, sparse setulosae, 4–9 mm. longae; petioli 3·5–10 mm. longi, triente inferiore incrassati subteretes, ceterum late alati, ala obovata elliptica vel suborbiculari; rhachis 1–2·2 cm. longa, late alata, ala obovata 0·7–1·4 cm. lata; foliola petiolulata, heteromorpha, ea paris superioris eis paris inferioris multo majora, juventute ciliata, costa supra sparse setulosa, demum glabra, supra opaca rete venularum inconspicuo, subtus nitidula manifeste reticulata; foliola inferiora ovata vel ovato-oblonga, 1·5–5 cm. longa, 1–2·5 cm. lata, breviter late obtuse cuspidata, acute apiculata, apiculo 0·5–1·2 mm. longo; foliola superiora subrhomboideo-lanceolata, pariter cuspidata et apiculata, apiculo 1–3 mm. longo, 4·5–8·5 cm. longa, 2–3·5 cm. lata, nervis utrinque circiter 10–13; glandulae interfoliolares breviter crasse stipitatae vel sessiles, circiter 1 mm. diametro. *Spicae* longiuscule pedunculatae, usque 20-florae; pedunculi sparse setulosi; rhachis 1·5 cm. longa, setulosa; bracteae arcuato-subulatae, circiter 5 mm. longae, sparse setulosae. *Alabastra* late clavata, breviter cuspidata. *Flores* vix pedicellati, circiter 3 cm. longi, pedicello (basi solida) circiter 0·5 mm. longo. *Calyx* campanulato-tubulosus, 5·5–6 mm. longus basi solida inclusa, extra subappresse setulosus; dentes subulati, 0·7–1·3 mm. longi sinibus subtruncatis. *Corolla* circiter 1·3 cm. longa, extra appresse fulvo-setulosa; lobi lanceolati, 2·5–3 mm. longi. *Tubus staminalis* circiter 1·1 cm. longus; filamentorum partes liberae 1·7–1·8 cm. longae. *Ovarium* breviter stipitatum, circiter 1·7 mm. longum; stylus circiter 2·8 cm. longus; ovula 12. *Legumen* ignotum.

Brazil. Ceará: Guarmaranga, about 50 miles inland, 900 m., *Bolland*.

Apart from the differences mentioned in the diagnostic phrase *I. Bollandii* approaches *I. ciliata* Presl closely in its technical characters, but the leaves are very different in general appearance,

the upper of the two pairs of leaflets being markedly larger than the lower. In *I. ciliata* there are usually 4–5 pairs of leaflets, gradually diminishing in size towards the base of the leaf.

1136. **Polyscias kikuyuensis** *Summerhayes* [Araliaceae]; ab affinibus *P. farinosa* (Del.) Harms et *P. Albersiana* Harms, pagina inferiore foliolorum maturorum, petiolulis, ramulis inflorescentiae, pedicellis fructibusque plus minusve dense fulvo-stellato-tomentosis satis distinguenda.

Arbor 15–18 m. alta; ramuli novelli fulvo-stellato-tomentosi, maturi glabri, cortice striato brunneo obtecti, cicatricibus foliorum delapsorum notati. *Folia* pinnata, magna, usque ad 28 cm. longa vel ultra; rhachis juventute fulvo-tomentosa, demum glabra, striata; foliola 3–4-(vel pluri) juga, 2–9 mm. petiolulata, ovata vel lanceolato-ovata, basi rotundata vel cordata, apice acuta, usque ad 18 cm. longa et 10·5 cm. lata, margine integerrima, supra glabra costa excepta, nitentia, subtus pilis flavidis vel fulvis stellatis dense induta; costa utrinque prominens, nervis lateralibus 12–16 patentibus versus marginem arcuatis supra impressis subtus prominentibus, nervis tertiariis numerosissimis reticulatis. *Inflorescentia* ramosa; ramuli primarii 15–32 cm. longi, fulvo-tomentosi, demum interdum glabrescentes; ramuli secundarii numerosi, 2–15 mm. in fructu usque ad 23 mm. longi, fulvo-tomentosi demum glabrescentes. *Flores* in umbellulis 5–14-floris apicibus ramulorum secundariorum dispositi, sessiles vel breviter pedicellati, ubique fulvo-tomentosi; calyx minutus, 4-dentatus; petala 4, ovato deltoidea, extra fulvo-tomentosa, intus glabra; stamina 4, antheris ellipticis, filamentis brevibus; ovarium 2-loculare, stylis 2 inferne connatis. *Fructus* ellipsoideus, compressus, leviter longitudinaliter costatus, fulvo-tomentosus vel glabrescens, 2–3 mm. pedicellatus, circiter 7 mm. longus, stigmatibus subreflexis coronatus.

Tropical Africa. Kenya Colony: Kikuyu Escarpment and Elburgon Forests, 2100–2400 m., timber tree up to 15–18 m. high, *A. M. Cooper in Herb. Battiscombe* 873 (type); Solai Forest, 2100 m., a tall timber tree with a diameter up to 1·2 m. Wood soft, white, inodorous, used for butter boxes. Common in wet forests all over the Colony above an altitude of 1800 m. An important economic tree. *H. M. Gardner in Herb. Battiscombe* 1294. Vernacular Name: Mutati (Kik).

1137. **Leucopogon** (§ **Perojoa**) **Rodwayi** *Summerhayes* [Epacridaceae-Styphelieae]; affinis *L. collino* R. Br., a quo floribus minoribus, forma bracteolarum et sepalorum, antheris brevioribus latioribusque et ovario majore differt.

Frutex circiter 45 cm. altus. *Rami* irregulariter ramosi, ramulis saepius versus apices ramorum confertis, pubescentes demum glabrescentes, cortice cinereo vel brunnescenti leviter ruguloso obtecti. *Folia* sessilia, lanceolata vel oblongo-lanceolata, apice acuta vix pungentia, basi angustata, 5–10 mm. longa, 1–2 mm. lata,

coriacea, plana vel margine leviter recurvata, minute denticulato-ciliata, utrinque glabra, costa supra impressa, nervis subtus mediocriter conspicuis. *Inflorescentiae* terminales vel in axillis foliorum superiorum dispositae, nutantes, pluriflorae, terminalibus usque ad 2 cm. longis, lateralibus brevioribus usque ad 8 mm. longis; rhachis pubescens; bracteae ovatae vel elliptico-ovatae, apice rotundatae, circiter 1 mm. longae, concavae, glabrae, subtus valde 7–nerviae. *Alabastra* ellipsoidea, 2–2·3 mm. longa. *Bracteolae* deltoideo-ovatae, basi late rotundatae, apice subacutae, circiter 1 mm. longae, superne ciliolatae, utrinque glabrae. *Sepala* 5, oblongo-elliptica, apice rotundata, circiter 1·5 mm. longa, superne ciliolata, marginibus non-hyalinis, plurinervia. *Corolla* late campanulata; tubus 0·7–0·8 mm. longus; lobi ovati vel lanceolato-ovati, apice subacuti, circiter 1 mm. longi, extra glabri, intus dense barbati. *Stamina* fauce corollae inserta, filamentis brevibus; antherae oblongae, superne parum angustatae, 0·5 mm. longae, 0·25 mm. latae, infra apicem sterilem brevem affixae. *Discus hypogynus* 5–lobatus. *Ovarium* ovoideum, 0·6 mm. longum, glabrum, biloculare, stylo 0·3 mm. longo coronatum; ovula pro loculo solitaria, ab apice pendula. *Fructus juvenilis* cylindricus, breviter stipitatus, longe rostratus, maturus non visus.

New South Wales. Jervis Bay, on barren sandstone country overlooking the Naval College and on Bowen Island, Sept. 1925, *F. A. Rodway*.

The accompanying figure shows the floral differences between the new species and *L. collinus*, the vegetative parts being almost identical.

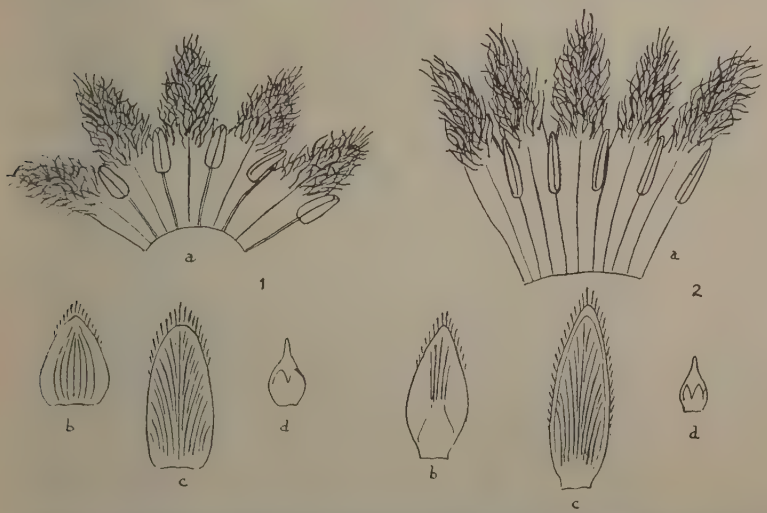

Fig. 1. *Leucopogon Rodwayi* Summerhayes. Fig. 2. *Leucopogon collinus* R.Br. (drawn from Brown's specimen collected at Port Dalrymple). a. corolla. b. bracteole. c. sepal. d. ovary.

1138. **Anthocleista keniensis** *Summerhayes* [Loganiaceae]; affinis *A. pulcherrimae* Gilg, a qua differt nervis lateralibus patentioribus et corollae tubo angustiore lobis fere duplo longiore.

Arbor 21–24 m. alta. *Folia* sessilia, elliptico-obovata vel obovata, 34–78 cm. longa, 13–28 cm. lata, apice rotundata, basi cuneata, coriacea, margine leviter undulata vel crenulata, revoluta; utrinque glabra; costa basi dilatata, utrinque valde prominens, nervis lateralibus utrinsecus 12–15 a costa fere angulo recto patentibus utrinque prominentibus ad marginem arcuatim conjunctis, nervis tertiariis numerosis prominente reticulatis. *Flores* in cymis magnis (25 cm. longis) multifloris thyrsoideis ex dichasiis compositis dispositi; bracteae deltoideae, acutae, 5–6 mm. longae, basi usque ad 1·6 cm. latae, coriaceo-induratae; pedicelli 0·5–1 cm. longi, crassi, articulati; sepala 4, ovata, aequilonga, coriacea, glabra; corolla calyce 3–4-plo longior, tubo angusto superne leviter et sensim ampliato circiter 3 cm. longo media parte 7·5 mm. diametro, segmentis ovato-lanceolatis acutis 1·6 cm. longis; stamina fauce corollae inserta; antherae sessiles, 7–9 mm. longae; ovarium ellipsoideo-ovoideum, 6 mm. longum; stylus gracilis, 2 cm. longus, stigmate capitato 3 mm. diametro coronatus. *Fructus* immaturus, ellipsoideo-ovoideus.

Tropical Africa. Kenya Colony: Sotik, 1800 m., tall timber tree, attaining a height of 21–24 m. Timber soft, leaves confined to ends of branches; not a forest tree, *Battiscombe* 1301 (type). East and South East Kenya, 1350–1500 m., tall tree, leaf-scars very prominent on old branches. *Battiscombe* 698.
Vernacular Name: Mutunguru (Kik).

1139. **Petunia Felipponei** *Sandwith* [Solanaceae-Salpiglossideae]; *P. humili* R. E. Fr. necnon *P. heterophyllae* Sendtn. affinis, ab illa foliorum fasciculis axillaribus, corollae lobis latis brevissimis, stigmate capitato; ab hac pedunculis pluries longioribus, calycis forma differt.

Suffrutex habitu non certe cognito sed verisimiliter prostrato, totus pilis brevissimis glanduliferis indutus, e radice perenni ramos numerosos ad 10–20 cm. longos emittens; internodia 0·3–1·8 cm. longa, versus summos caules sensim elongata. *Folia* alterna, sessilia, lineari-lanceolata vel lineari-oblonga, obtusa, 0·5–1·1 cm. longa, 1–2·5 mm. lata, omnia sed praesertim inferiora fasciculos axillares foliorum multo minorum sustinentia, plana, nervo inconspicuo sed basi tumido petioloideo, utrinque ut caules pedunculi calycesque pilis brevissimis glanduliferis obtecta. *Pedunculi* axillares, floriferi ascendentes, postea superne sursum arcuati, 2·5–3 cm. longi, itaque foliis pluries longiores. *Calyx* infra medium in lacinias subulatas acutas vel lineari-oblongas obtusas, aliquantum inaequales, 4–7 mm. longas, basi 1–1·5 mm. latas divisus; tubus obconicus 4 mm. longus, nervis 10 satis inconspicuis. *Corolla* pro hac sectione generis magna, late infundibularis, 2·2–2·6 cm. longa, tubo sparse glanduloso-piloso, ad 5 mm.

supra basin 2 mm. lato, tum maxime ampliato, limbo 2–2·5 cm. diametro in lobos brevissimos rotundatos diviso. *Stamina* 5 inclusa, 3 mm. supra basin corollae affixa, glabra, didynama, quinto duobus brevioribus paullo minore; stamina 2 longiora 6 mm., 2 breviora 3·5 mm. longa, quintum 3 mm. longum, parte adnata exclusa. *Ovarium* glabrum, ovoideum, 1·5 mm. longum, 1 mm. diametro; stylus glaber, 6 mm. longus, apice curvatus, stigmate discoideo-capitato; ovula numerosa, globoso-reniformia.

URUGUAY. Cerro Montevideo, *Herb. Dr. Florentino Felippone* 5085. The characters of this plant, showing affinity with both *P. humilis* R. E. Fr. and *P. heterophylla* Sendtn., are such as to suggest the possibility of hybridity; but *P. heterophylla* does not appear to have been recorded from Uruguay.

1140. **Polystachya (Caulescentes) microbambusa** *Kraenzl.* [Orchidaceae–Vandeae]; differt a *P. ensifolia* Lindl., floribus fuscis, petalis multo angustioribus, labello longius acuminato, ceterum habitu graciliore.

Radices copiosae longae albae. *Caules* stricti ad 40 cm. alti, basi plerumque defoliati vel cataphyllis marcescentibus vestiti, deinde foliati. *Folia* subdisticha, ad 10, ex vaginis basilaribus, sensim increscentia vel longissime lineari-lanceolata, 5-nervia, 8–15 cm. longa, 5–8 mm. lata, stricta, erecta, racemum pauciflorum excedentia, longe acuminata. *Racemus* speciminis unici mihi visi 6 mm. longus, vaginis 2 vel 3 (vel foliis magnitudine reductis) subcompressis acuminatis vestitus; rhachis brevisetosa, sicca sordide rubra; flores ad 5; bracteae anguste lineares ad 8 mm. longae, ovaria brevissime setosa aequantes. *Sepala* e basi paulo latiore triangula, longe acuminata, lateralia mentum nigro-setosum brevissimum triangulum obtusum formantia, 10 mm. longa; mentum vix 2 mm. longum, basi circiter 2 mm. latum. *Petala* linearia, 7–8 mm. longa, circiter 0·75 mm. lata, sepalis lateralibus arcte agglutinata. *Labellum* hastatum; lobi laterales trianguli, fere rectanguli; lobus intermedius longe productus, acuminatus, in disco pulverulentus, totum ad 8 mm. longum, inter lobos laterales basi circiter 3 mm. latum. *Gynostemium* latum. *Flores* (in sicco) intense sordide rubri fere nigri.

WEST TROPICAL AFRICA. Ivory Coast: Cèrcle de Baoulé-Nord, environs de Bouake, Mt. Lémélébon, fl. July, *F. Fleury* 22093.

Habitu Polystachyis Caulescentibus adscribenda et juxta *Polystachya ensifoliam* Lindl. et *P. imbricatam* Rolfe inserenda erit. Diagnosin scripsi ex alabastro maturo, floribus apertis ab insectis nimium injuriatis partes florum forsan paululo minores descripsi quam re vera sint. Tota planta aspectum praebet quam nomine specificio expressi.

Digitaria Eylesii *C. E. Hubbard* sp. nov.; affinis *D. monodactylae* var. *explicatae* Stapf, sed spiculis glabris et culmis non caespitosis differt.

Gramen perenne, 60-65 cm. altum, e rhizomate longo repente ortum, internodiis nudis vel cataphyllis glabris vel cataphyllarum vestigiis indutis. *Culmi* erecti, graciles, glabri, simplices, 3-nodi, nodis glabris. *Folia* 4-5-nata, distantia; vaginae arctae, firmae, glabrae, laeves; ligulae truncatae, membranaceae, usque ad 0.75 mm. longae, glabrae; laminae lineares, superne longe tenuiterque attenuatae, 7.5-14 cm. longae, 2.5-3.5 mm. latae, planae, flexuosae, post ligulam pilis longis paucis exceptis glabrae. *Racemi* spiciformes, solitarii, terminales, graciles, 10-14 cm. longi, rhachi triquetra undulata 0.6 mm. lata, marginibus angustissimis viridibus tenuiter scabridis; pedicelli 2-3-nati, superne glabri vel hispiduli, inaequales, usque ad 1 mm. longi. *Spiculae* adpressae vel leviter patentes, lanceolato-ellipticae, acutae, 2.5-3 mm. longae, glabrae. *Gluma inferior* absens vel squamata minuta et hyalina; gluma superior late lanceolata, acuta, hyalina, 2 mm. longa, 3-nervia. *Anthoecium inferum* sterile; valva spiculae ambitu et magnitudine similis, subapiculata, 5-7-nervia, costa media quam lateralia prominentiore; valvula minuta. *Anthoecium superum* ♀; valva late lanceolata, acuta ad subapiculata, 2.5 mm. longa, tenuiter coriacea, atrobrunnea vel nigra, marginibus hyalinis; valvula similis sed minor. *Antherae* 1.5 mm. longae.

Tropical Africa. Rhodesia: Salisbury, on river bank, 1530 m., *Eyles* 3277.

This species is remarkable in having glabrous spikelets and in habit it is quite distinct from any other African *Digitaria*, its affinity being with *D. monodactyla* Stapf, in regard to the solitary raceme, and with the species of § *Setariopsis* as to its glabrous spikelets.

Digitaria Grantii *C. E. Hubbard* sp. nov.; affinis *D. Myuro* Stapf, sed laminis et culmis glabris, racemis plus minusve laxe vele contract paniculatis differt.

Gramen perenne, caespitosum, ad 50 cm. altum. *Culmi* erecti, simplices, teretes, superne (infra basin paniculae) pilosi, ceterum glabri, laeves, 1-2-nodi, nodis villosis. *Folia* plerumque basilaria; vaginae inferiores solutae, breves, basi dense pilosae, persistentes, demum fibrosae; superiores teretes, pilis e tuberculis minutis laxe indutae vel glabrae et laeves, in innovationibus imbricatae, purpurascentes, ore hirsutae; ligulae truncatae, ad 1 mm. longae, membranaceae, glabrae; laminae lineares vel lineari-lanceolatae, apice attenuatae, in innovationibus basi attenuatae, usque ad 10 cm. longae et 6 mm. latae, opaco-virides, purpureo suffusae, glaucae, glabrae, infra laeves, supra leviter scaberulae, marginibus scabris. *Panicula* usque ad 8 cm. longa; axis primarius 4-6 cm. longus, pilis albido-flavescentibus dense pilosus; racemi 8-15, plus minusve

compositi, erecti vel leviter patentes, solitarii vel 2-3-nati, inaequales, basin versus longiores et usque ad 4.5 cm. longi; rhachis primaria gracilis, triquetra, usque ad 0.5 mm. lata, longe pilosa, secondaria perbrevis, pedicellis ad 1.5 mm. longis vel brevioribus inaequalibus angularibus, pilis albido-flavescentibus spiculis aequilongis. *Spiculae* 1-4-natae, oblongae, obtusae ad subacutae, 1.8-2 mm. longae, glabrae; gluma inferior 0; gluma superior minuta, hyalina, truncata, integra vel lobulata, enervia, usque ad 0.5 mm. longa, albida vel purpureo suffusa, ad basin spiculae arcte appressa. *Anthoecium inferum* sterile; valva spiculam aequalis vel fere aequalis, ovato-oblonga, membranacea, albida, purpureo suffusa, 3-sub-5-nervia; valvula 0. *Anthoecium superum* ♀; valva late oblonga, obtusa ad subacuta, 1·9 mm. longa, pallide vel atrobrunnea, subcoriacea, marginibus hyalinis, tenuiter et arcte striata; valvula valvae similis sed angustior.

Tropical Africa. Tanganyika Territory: 2500 m., without precise locality, *D.K.S.Grant* 7 (in Herb. *Battiscombe* 1240).

"In small patches of 1 to 5 sq. yards, does not appear in cattle districts on the plains according to Masai" (*Grant*). A specimen from Kenya Colony (*J. McDonald* 928) is either a variety of this species or a closely allied new species; it has hairy and longer leaves and a much longer panicle (22 cm. long). The material available however is too scanty for description.

Digitaria mombasana *C. E. Hubbard* sp. nov.; affinis *D. erianthae* Steud., et *D. milanjianae* Stapf, sed foliorum vaginis dense villosis et spiculis minoribus differt.

Gramen perenne, ad 1.2 m. altum. *Culmi* erecti, e rhizomate breve orti, teretes, glabri, nitidi, simplices, 4-5-nodi, nodis glabris, internodio superiore longe exserto. *Foliorum vaginae* solutae, striatae, pilis longis albis patenti-reflexis molliter et dense villosae; ligulae truncato-crenulatae, scariosae, minute ciliatae; laminae lineares, superne longe tenuiter attenuatae, 16-45 cm. longae, 6-9 mm. latae, utrinque molliter tomentosae, marginibus cartilagineis et scaberulis. *Panicula* 10-13 cm. longa; axis primarius 3.5-5.5 cm. longus, scaberulus; racemi circiter 13, sessiles, 2-5-nati, 7-12 cm. longi, suberecti vel patentes, stricti vel flexuosi, pallide fusci; rhachis gracilis, triquetra, 0.75 mm. lata, marginibus angustis tenuiter scabridis; pedicelli 2-nati, inaequales, usque ad 1 mm. longi. *Spiculae* adpressae, imbricatae, lanceolato-ovatae, 2 mm. longae, ciliati-fimbriatae pilis longis acutis laevibus pallide luteis instructae. *Gluma inferior* minuta, ovata, obtusa, hyalina, enervia; gluma superior lanceolata, 1.5 mm. longa, 3-5-nervia, marginibus et apice pilosa, membranacea. *Anthoecium inferum* sterile; valva ovata, subobtusa, 2 mm. longa, 5-nervia, membranacea, marginibus et inter nervos marginales pilosa; valvula minuta. *Anthoecium superum* ♀; valva lanceolato-ovata acuta, 1.9 mm. longa, cinerea; valvula similis sed angustior.

Tropical Africa. Kenya Colony, coast and up to 60 m.

FIG. 1. FIG. 2.

Fig. 1. **Digitaria Eylesii** *C. E. Hubbard,* showing habit. A. ligule (nat. size). B. portion of raceme (x 6). C. D. spikelet (x 9). E. valve of lower floret (x 9). F. valvule of lower and part of upper floret (x 10). G. valve of upper floret (x 10).

Fig. 2. **Digitaria Grantii** *C. E. Hubbard,* showing habit. A. ligule (x ½). B. portion of raceme (x 2). C. spikelet (x 10). D. upper glume (x 8). E. valve of lower floret (x 9). F. valve of upper floret (x 10). G. valvule (x 10).

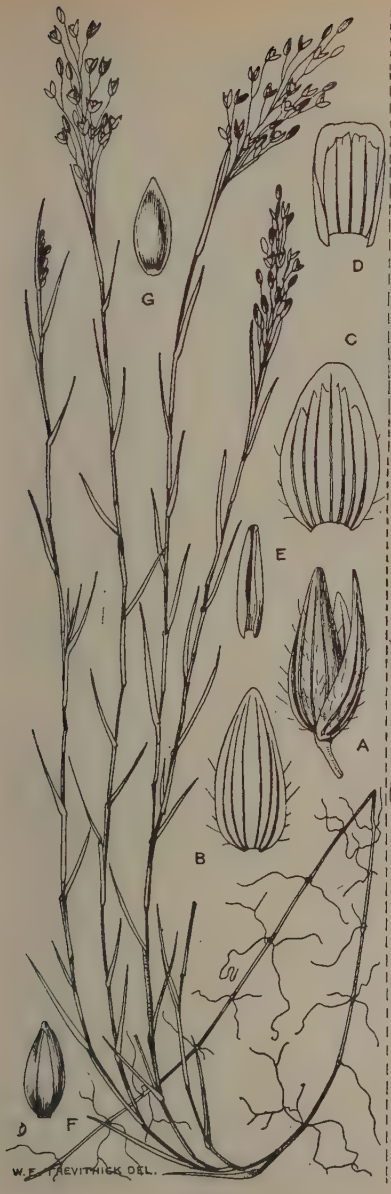

FIG. 3.

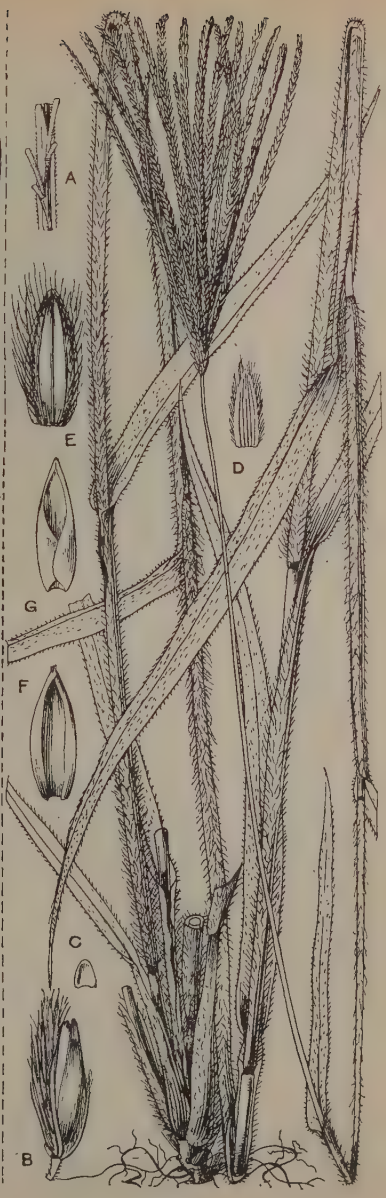

FIG. 4.

Fig. 3. **Panicum striatissimum** *C. E. Hubbard*, showing habit. A. spikelet (x 8). B. lower glume (x 8). C. upper glume (x 9). D. valve of lower floret (x 6). E. valvule (x 6). F. & G. valve of upper floret (x 6).

Fig. 4. **Digitaria mombasana** *C. E. Hubbard*, showing habit. A. portion of rhachis showing pedicels (x 4). B. spikelet (x 10). C. lower glume (x 25). D. upper glume (x 7). E. valve of lower floret (x 10). F. valve of upper floret (x 10). G. valvule of upper floret (x 10).

near Mombasa, on moist sandy soils, usually found in small patches of 1-3 sq. yds, *D. K. S. Grant* (in Herb. *Battiscombe* 881).

Vern. Name. "Ukusi."

Panicum striatissimum *C. E. Hubbard* sp. nov.; affinis *P. subflabellato* Stapf, et *P. neglecto* Roem. et Schult., sed gluma inferiori 7-nervis et quam spicula aequilonga differt.

Gramen perenne, debile. *Culmi* densi, e basi decumbente erecti vel patentes, 40-60 cm. longi, gracillimi et subfiliformes, teretes, glabri et laeves, multinodi, nodis glabris, ad nodos inferiores radicantes, multiramosi. *Foliorum vaginae* arcte striatae, laeves, glabrae vel margines pubescentes, 1.5-3.5 cm. longae. *Ligulae* ad seriem ciliarum minutarum reductae. *Laminae* erectae, rigidae, lineari-subulatae, involutae, striatae, 1.75-2.75 cm. longae, infra glabrae et laeves, supra leviter pubescentes. *Panicula* ambitu anguste ovata, ad 3 cm. longa, spiculis paucis; rhachis gracilis, teres, laevis; pedicelli gracillimi, flexuosi, 4-6 mm. longi. *Spiculae* ovato-oblongae, 3-3.75 mm. longae, acutae, pilis albis mollibus paucis obscuris pubescentes, nervis conspicuis. *Glumae* firme membranaceae, apice et margine hyalinae, inferiores ovato-lanceolatae, subobtusae, spiculis aquilongae, 6-7 nervae, superiores ovato-oblongae, 2.8-3.5 mm. longae, rotundato-truncatae, 6-7-nervae, cum nervis anastomosantibus. *Anthoecium inferum* ♂; valva late oblonga, 2.5-2.8 mm. longa, truncata, apice et margine hyalina, 5-subseptem-nervia, infra apicem cum nervis anastomosantibus; valvula angusta, truncata, 2.5-2.8 mm. longa. *Anthoecium superum* ♀; valva ovata, subacuta, 2.2-2.5 mm. longa, nitida, laevis. *Antherae* 1.3-1.6 mm. longae.

Tropical Africa. Kenya Colony: western slopes of Mount Kenya, along the trail from West Kenya Forest Station to summit, in the Bamboo zone, at about 3000 m. elevation; *Mearns* 1682 (type), 1750, 1760, 1766.

XXXIII.—MISCELLANEOUS NOTES.

The following appointments have been made by the Secretary of State for the Colonies:—Mr. C. E. L. Anderson, Mr. D. P. Stanfield, Mr. D. B. Sabiston, B.Sc., Mr. J. F. B. Watling, Mr. A. H. Young, B.Sc., to be Produce Inspectors, Nigeria: Mr. P. J. Moss, B.Sc., to be Provincial Superintendent of Agriculture, Sierra Leone : Mr. R. E. Holttum, B.A., to act as Director, Botanic Gardens, Straits Settlements (*K.B.* 1922, p.223).

Miss Caroline Thackeray.—We learn with regret of the death, on the 30th January last at Mbweni, of Miss Caroline Thackeray. Since her retirement in 1902 from the mission work which had engaged her attention at Mbweni since her arrival there in 1877,

Miss Thackeray had lived in the Shamba la Balozi, at Mbweni, which was associated so intimately with the late Sir John Kirk (*K.B.* 1916, p. 1 ; 1922, p. 62). Its care had been one of her interests, and it is to be hoped that this historic plantation will continue to be maintained and kept intact in memory of that great African pioneer Sir John Kirk.

Dr. W. T. Brigham.—We regret to record the death on the 29th January last of William Tufts Brigham, Director of the Bernice Pauahi Bishop Museum, Honolulu. Although chiefly interested in ethnology, Dr. Brigham did much to further the economic interests of the island, and illustrated by exhibits in the Museum the history and produce of the Hawaiian islands. The present excellent state of the Museum is almost entirely due to the work of Dr. Brigham.

Eduard Hackel.—On February 17th Eduard Hackel, the agrostologist, died in his home at Attersee, Upper Austria, after a short illness. Although he had for a considerable time taken no active part in agrostological research, and although his leading publications were in fact crowded into the short space of less than a decade (1881–1889), so well-founded was his early work that it still appears almost as fresh and to command as much attention as when the results of his labours were made known.

The secret of his success was due in the main to his thoroughness and to his independence and freshness of thought coupled with a masterly exposition of the facts he had established and the ideas which in his eyes linked them into a whole. He was not especially anyone's pupil or follower. The course of his training kept him aloof from the ties of a powerful "school," which to a rising mind are as often a hindrance as they are a stimulus. He gave himself a good grounding in the theorising morphology which held the field when he took up the study of grasses and in the then modern technique of the systematist. As far as his special line of research is concerned the influence of Duval-Jouve's fine work was evidently a prominent factor. To this general equipment he added a keen eye for the detail and a persistent industry in following it up which must often have meant a considerable physical strain. He might well have lost himself in it but for method and a highly developed sense of synthesis. There could have been no severer test for this than the *Andropogoneae* which he monographed for De Candolle, a group of bewildering and apparently unconformable diversity. For the practical need of the man who has to name grasses he raised the art of description to a level hardly reached before him. So accurate and so full is the account he generally gives of a species that it is possible to prepare a drawing from it which when ultimately compared with an actual specimen will be found to tally with it to an astonishing degree.

Hackel's first publication *Untersuchungen über die Lodiculae der Gräser* (1881) was an attempt to interpret the morphological status of these peculiar and important organs of the grass flower. It contains some ingenious theorising, but hardly the final solution of the problem. It was followed by a *Monographia Festucearum Europaearum* (1882), a remarkably fine piece of delicate analysis and rather far-going and overgraded synthesis, particularly valuable, as it was largely tested by the study of living material.

We find him next engaged on work of a much more comprehensive scale, the elaboration of the *Gramineae* for Engler & Prantl's "Natürliche Pflanzenfamilien," which was brought to its conclusion in 1889, and of which a version in English appeared in 1896 under the title *The True Grasses*. This is the most universally known of his works and it still holds the field to a large extent. It is by no means his most original work and in fact it could not have been so. By the necessity of all the circumstances, the size of the family, the limited time available, the cyclopedic character of the publication it had to fit in and not least the conditions under which the work was carried on—the author was then teaching in a provincial town thirty-eight miles from the great herbaria and libraries of Vienna —Hackel was compelled to confine himself to a considered compilation from literature. The last volume of Bentham and Hooker's Genera Plantarum, containing the *Gramineae*, had just come out and it formed an admirable basis for a condensed practical synopsis. Prefaced with a lucid introduction into the general features of the family, and drawn up on a clear and workable plan, with a modicum of suitable illustrations—the synopsis caught on from the beginning and was soon generally accepted as the standard work on the genera of the grasses.

I have already referred to Hackel's magnum opus, his monograph of the *Andropogoneae* (1891), one of the masterpieces of descriptive botanical literature. This is not the place to enlarge on or to criticize it. It will for all time remain the foundation of our knowledge of this rich and puzzling group; but exploration, particularly that of the African floras, has since added such a wealth of forms that the perspective of our vision of the group is not any longer the same. New types have been added and old receptacles have been filled to bursting-point. Adjustment is unavoidable, but the solid framework of Hackel's monograph and the careful elaboration of the detail will endure. It is only natural that Hackel, once he had become an "authority" in his field, should be flooded with grasses for naming and eventual description from all parts of the world. For a long time he responded and numerous lists of identifications of grasses and of descriptions of new species from his pen are scattered through literature. His last contribution, a continuation of *Gramineae Novae* in Fedde's Repertorium, appeared in 1913.

Hackel was born on the 18th March, 1850, at Haida, in German Bohemia. After the usual preparation afforded by the Austrian

"Realschule" of those days (1859–1865) he went to Vienna, where, for the next three years, he attended a liberal course of lectures at the Polytechnic High School, obtaining finally the diploma for teaching natural history and chemistry in the "Realschule." This soon led to his appointment at the "Realschule" at St. Pölten, where he remained until his retirement in 1900. In 1876 he travelled largely in Spain and Portugal.

He was a man of fine physique and with prepossessing appearance and a warmth of character that were well-nigh irresistible. He had refined tastes and in his many years of leisure he and his wife travelled much in pursuit of their interests in the domains of art and science. When he selected Attersee, there to build for himself a tusculum, he was partly influenced by the charm of the scenery and the comparative mildness of the climate of the place, which he hoped would allow him, in a fair measure, to indulge in horticulture. In this he was not disappointed ; but in the end the evening of his life was blighted when the war and its consequences sadly reduced his resources and he found himself tied to a house and garden the upkeep of which was beyond his means.

O. S.

Abnormal Agave.—Most species of *Agave* bear the inflorescence at the apex of the short stem and die soon after the seeds have ripened, but not infrequently before doing so they produce lateral suckers from which new plants can be propagated. A plant of *Agave Ellemeetiana* C. Koch, now in the Succulent House at Kew, has recently produced several lateral inflorescences at the ground level below the lowest leaves. The largest of these spikes has reached a height of nearly a metre and borne numerous perfect flowers. A similar development in *Agave americana* L. is recorded in the Gardeners' Chronicle, 1884, xxii. p. 53, fig. 15, as occurring in the Botanic Gardens, Oxford, but in this case the inflorescence bore only two flowers and they were not perfectly developed.

C. H. W.

Nemophila.—In a paper published in the Kew Bulletin No. 1, 1926, dealing with certain species of this genus, we remarked that our work was limited because we had had no opportunity of field-work in California. We have recently received a letter from Miss Alice Eastwood, of the California Academy of Sciences, in which she states that the conclusions reached by us agree with her observations in the field. The following generalizations regarding habitat are given by Miss Eastwood: "*Nemophila atomaria* always grows in quite wet places, but not swamps. *Nemophila insignis* grows in sandy ground generally and never in wet places. *Nemophila liniflora* grows on hills adjacent to the ocean and is quite distinct from the other two. I collected it before the fire in 1906 at Bodega Head, where the type was collected. My specimens were destroyed

in the fire and I've not been able to go there since as it is a rather inaccessible place. I don't know *N. integrifolia* at all, but have always regarded it as one of the small flowered lot." It is extremely satisfactory to know that the results derived from genetical and herbarium studies are so far in agreement with independent conclusions reached by studying the living plants in their native habitats.

R. J. C. and W. B. T.

Calophyllum apetalum.—Willdenow in 1811 gave the name *Calophyllum apetalum* to *Tsjerou-ponna* Rheede, Hort. Mal. iv. 81, t. 39 (1683) and *Inophyllum flore quadrifido* Burm. Thes. Zeyl. 130, t. 60 (1737), which Linné (Sp. Pl. 514 : 1753) had erroneously included in *C. Calaba* L. In 1824 Choisy substituted the name *C. spurium* for *C. apetalum*, apparently on the ground that the latter was misleading. Wight and Arnott adopted *C. spurium* in 1834, but in 1840 Wight proposed the new name *C. decipiens*, because he had come to the conclusion that *spurium* was also misleading. He excluded Burmann's Ceylon plant from the species, calling it *C. Burmanni*.

In 1861 Planchon and Triana took up the "nomen nudum" *C. Wightianum* Wall. Cat. n. 4847 for Rheede's species, because *apetalum* and *spurium* seemed to them unsuitable, and *C. decipiens* had been misapplied by Thwaites to a Ceylon plant, *C. Thwaitesii* Planch. et Triana. *C. Wightianum* has been accepted in the Flora of British India, in Vesque's monograph of the Guttiferae, and by most recent authors. *C. decipiens*, however, was revived by Dunn in 1915. Under the International Rules of Nomenclature the fact that a name is considered to be misleading or inappropriate does not warrant its rejection, and the correct name for the species in question is *C. apetalum* Willd. Its synonymy is as follows:—

Calophyllum apetalum *Willd.* in Ges. Naturf. Fr. Berl. Mag. 1811, v. 79, excl. stirp. zeylan.

C. spurium Choisy in DC. Prodr. i. 563 (1824); Wight et Arn. Prodr. i. 103 (1834).

C. decipiens Wight, Ill. 128 (1840); Ic. i. t. 106; Dunn in Gamble Fl. Madras i. 76 (1915).

C. Wightianum Wall. Cat. n. 4847 (1831), nomen; Planch. et Triana in Ann. Sc. Nat. sér. 4, xv. 256 (1861); T. Anders in Hook. f. Fl. Brit. Ind. i. 274 (1874) ; Vesque in DC. Monogr. viii. 569 (1893).

T. A. S. and C. E. C. F.

Xylopia hastarum *M. L. Green.*—In preparing a paper on the "Standard-species of the Nomina Conservanda (Phanerogamae)" it was noticed that two different species had borne the name *Xylopia glabra*. It was originally based by Linné (Syst. ed. 10, 1250: 1759) on *Xylopia pedunculis subunifloris, fructibus glabris*

Pluk. Phyt. t. 238, f. 4, a Barbados plant which Fawcett and Rendle (Fl. Jam. iii. 199: 1914), who have examined the type specimen in Herb. Sloane, identify with *Anona squamosa* L. As has been clearly shown by these authors, Linné subsequently (Sp. Pl. ed. 2, 1367: 1763) added the synonym *Xylopicrum foliis amplioribus nitidis ovatis, petiolis brevibus, fructibus glabris* Browne Jam. 251. The latter is the White Lancewood of Jamaica, and is a true *Xylopia*. Dunal (Monogr. Anon. 121, t. 19: 1817) cited both the Plukenet and the Browne synonyms, but his description and figure of *Xylopia glabra* were taken from a specimen of the White Lancewood of Jamaica, and with this species the name *X. glabra* has since been associated. In accordance with the generally recognized principle that "a wrong identification cannot be treated as a valid name" (*vide* Schinz & Thell. in Vierteljahrsschr. Nat. Ges. Zürich, lxvi. 313; Sprague in Journ. Bot. 1922, 138) it seems desirable to give a new name to the endemic Jamaican species, which has been erroneously identified with *X. glabra* L., and it may therefore be called *X. hastarum* in allusion to the vernacular name "Lancewood."

Xylopia hastarum *M. L. Green*, nom. nov.—*X. glabra* L. Sp. Pl. ed. 2, 1367 (1763), partim; Dunal, Monogr. Anon. 121, t. 19 (1817), excl. syn. Pluk.; Fawcett & Rendle, Fl. Jam. iii. 199 (1914); non L. (1759).

M. L. G.

Index Kewensis, Supplement VI.—The sixth Supplement to the Index Kewensis, which was published on April 23, 1926, continues that work to the end of the year 1920. In addition to names published during the quinquennium 1916–20 it includes many published during the years 1914–15 which, owing to the War, were not available for insertion in Supplement V. The diminution of botanical research during the later years of the War is reflected in the smaller size of the sixth Supplement, which consists of 222 pages compared with 277 in Supplement V.

At the time when the Index Kewensis was originally prepared, the year 1735 was accepted as the starting-point for genera, hence many generic names were inserted in the Index with references which are now invalid under the International Rules of Nomenclature. These are now replaced by references to the first places of publication, starting from the year 1753.

As the result of generic segregation it sometimes happens that the same generic name, ascribed to the same author, is applied in two or more mutually exclusive senses by different writers. Thus the name *Achyranthes* is nowadays given to two distinct genera which were originally included in *Achyranthes* L. For convenience of consultation such different applications of the same generic names are indexed separately.

The publication of this Supplement has been considerably accelerated by three annual grants received from the British Association. This generous assistance has also been of great help in expediting the work now in progress on Supplement VII, which deals with the names published during the years 1921–1925.

East African Grasses.*—With the object of assisting officials and residents in Tropical Africa to recognise their local pasture plants, a small book comprising descriptions and illustrations of twenty common East African grasses has been prepared at Kew for the Governments of British East Africa. The work originated from a suggestion made by the Veterinary Adviser to those Governments, and it is hoped that the book will be the first of a series which will eventually cover the whole flora.

In the introduction a typical grass plant is described in simple language, and details of the floral structure are given, with illustrations of the essential parts. There is also a simple account of the general principles on which the classification of the grasses is based. Each species is illustrated by a text figure, which occupies a whole page and is accompanied by a full description in simple language, together with notes on the vernacular names, distribution, habitat and economic uses. It is hoped that by means of the illustrations, which have been specially prepared for this work, and the descriptions, the plants may be recognised in the field even by persons who have not had the advantage of previous botanical training.

The Pruning of Trees and Shrubs.†—This little volume of ninety-two pages should prove of great value to both amateur and professional cultivators of trees and shrubs. It is based on Mr. Dallimore's long experience at Kew and embodies the principles and practice of pruning as it is carried on there. The book may be especially recommended to the Superintendents of public parks and gardens in this country, where the pruning of shrubs is little understood and, in fact, very often degenerates into a mere clipping. A very useful feature of the book is the advice it gives on the treatment of old and neglected trees, a matter about which a great number of enquiries are addressed to Kew. Still the whole book is packed with valuable information, written in concise and untechnical language, and reflects great credit on its author and publishers.

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* East African Pasture Plants. 1. East African Grasses. The Crown Agents for the Colonies, 4, Millbank, London, S.W. 1926, pp. 56, text figs. 28. Price 2s. 6d.

† By W. Dallimore. Dulau & Co., 34, Margaret Street, W. 1, 1926, pp. 92. Price 4s. 6d.

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